FROM SCIENCE TO ACTION UNDER THE BASEL, ROTTERDAM AND STOCKHOLM CONVENTIONS

2022

SECRETARIAT OF THE BASEL, ROTTERDAM AND STOCKHOLM CONVENTIONS

BRS CONVENTIONS

Food and Agriculture Organization of the United Nations

UN environment programme

FROM SCIENCE TO ACTION UNDER THE BASEL, ROTTERDAM AND STOCKHOLM CONVENTIONS

2022

SECRETARIAT OF THE BASEL, ROTTERDAM AND STOCKHOLM CONVENTIONS

BRS CONVENTIONS

Food and Agriculture Organization of the United Nations

UN environment programme

Acknowledgement:

The Governments of Norway is gratefully acknowledged for providing the necessary funding that made the production of this publication possible.

Disclaimers:

The views expressed in this publication are those of the authors and do not necessarily reflect the views of SBC/SRC/SSC, the United Nations Environment Programme (UNEP), the United Nations (UN) or contributory organizations. SBC/SRC/SSC, UNEP or the UN do not accept responsibility for the accuracy or completeness of the contents and shall not be liable for any loss or damage that may be occasioned, directly or indirectly, through the use of, or reliance on, the contents of this publication.

The designations employed and the presentation of the materials in this publication do not imply the expression of any opinion whatsoever on the part of SBC/SRC/SSC, UNEP or the UN, concerning the geo-political situations or the legal status of any country, territory, or city or area or their authorities, or concerning the delimitation of their frontiers or boundaries.

Recommended citation: UNEP (2022). From Science to Action under the Basel, Rotterdam and Stockholm conventions. Secretariat of the Basel, Rotterdam and Stockholm Conventions, United Nations Environment Programme.

Contact information:

Secretariat of the Basel, Rotterdam and Stockholm Conventions
Office address: 11-13, Chemin des Anémones - 1219 Châtelaine, Switzerland
Postal address: Avenue de la Paix 8-14, 1211 Genève 10, Switzerland
Tel.: +41 22 917 8271
Email: brs@un.org

TABLE OF CONTENTS

1. INTRODUCTION

In 2019, the United Nations Environment Assembly adopted resolution 4/8 on sound management of chemicals and waste which, *inter alia*, notes that "the production and use of chemicals globally is expected to increase threefold and that the global use of materials will more than double by 2050" and emphasizes "the importance of strengthening the science-policy interface and the global evidence base for chemicals" (UNEP/EA.4/Res.8). Furthermore, in 2019 the conferences of the Parties to the Basel, Rotterdam and Stockholm (BRS) conventions requested the Secretariat to undertake capacity-building and training activities to support Parties in science-based decision-making and action in the implementation of the BRS conventions.

The 2022 resolution adopted by UNEA-5 to establish a science-policy panel to support action on chemicals, waste and pollution (UNEP/EA.5/Res.8) reflects widely concerns about the impact of pollution on human health and the environment. These concerns are shared by the BRS conventions, multilateral environmental agreements which share the common objective of protecting human health and the environment from hazardous chemicals and wastes.

This document outlines the role of BRS conventions in global governance of chemicals and waste, identifies possible synergies between existing mechanisms of the BRS conventions and a future science-policy panel, and – drawing on the experience of these conventions – offers some suggestions for stakeholders to consider as they plan a new science policy panel to contribute further to the sound management of chemicals and waste and prevent pollution.

All three of the BRS conventions were designed to position evidence at the heart of their decision-making. Over the years, each of these conventions has faced new and emerging environmental challenges, and in the process of responding, has strengthened its work to integrate new expertise into decision-making, involve stakeholders, and build networks and partnerships for science-based action.

With distinct mandates to address different causes and consequences of chemical pollution, the BRS conventions tackle the full life-cycle of toxic chemicals, including the production, use and disposal of persistent organic pollutants, international trade in hazardous pesticides and industrial chemicals, and the transboundary movements and disposal of hazardous wastes. As our understanding of these issues has developed, thanks to growing experience, advancing research, and improvements in data collection, interconnections among the three conventions have become increasingly obvious, and Parties have worked to enhance cooperation and coordination of these three multilateral environmental agreements. In parallel and with close coordination where needed, the BRS conventions facilitate evidence-based policymaking, ensuring that policy actions are based on scientific data and analysis of risks posed by chemicals and waste.

Studies indicate that both chemical pollution and waste generation are increasing at exponential rates, with an estimated 350,000 synthetic chemicals currently registered for production and use around the world (Wang et al. 2020). The individual and collective impact of these chemicals, many of which persist in the environment for many years, is significant and yet frequently less publicly salient than other major environmental challenges, including climate change and biodiversity loss. One recent analysis indicates that growth in "synthetic chemical production and diversification, particularly within the developing world, outpaced these other agents of global change" (Bernhardt et al. 2017). Another set of experts warns that "anthropogenic chemical pollution has the potential to pose one of the largest environmental threats to humanity" (Naidu et al. 2021). UNEP has also acknowledged the urgency of addressing pollution, characterizing the interconnected threats posed by pollution and waste, nature and biodiversity loss, and climate change as a "triple planetary crisis" driven by unsustainable production and consumption.

The chemicals and waste issue area is broad, encompassing the full life cycle of both natural and synthetically produced industrial chemicals and pesticides; the mining, use and waste management of elements such as mercury; and the disposal and management of waste materials which pollute our air, land and waterways both in their original forms and as they break down over time. Effective action to address plastic pollution, for example, requires not only improved environmentally sound waste management, but also sound management of chemicals in plastics. Furthermore, many argue that managing the impact of plastic pollution will require action upstream, including at the production stage. As such, the challenges posed throughout the lifecycle of chemicals are multifaceted and require a holistic response. Different aspects of plastic pollution issues are currently being considered under both the Basel Convention and the Stockholm Convention. UNEA-5

also decided to begin negotiations to establish a new international legally binding instrument to address plastic pollution; the work of this international legally binding instrument, should it be created, would have close connections to the work of existing multilateral environmental agreements that are designed to address certain facets of these issues.

As the interconnections among critical environmental challenges become increasingly clear, delegates to UNEA-5 recognized a need to create a new science-policy body that will take a holistic approach to the multifaceted and diverse issues related to the sound management of chemicals and waste and prevention of pollution.

As the global community considers developing a science-policy panel, it can draw on examples of current, successful interfaces between science and policy. It must also carefully consider the relationship between a possible new science policy interface and existing mechanisms for science-policy work, ensuring that the body works effectively and efficiently with these mechanisms. Drawing on the experiences of the different mechanisms for ensuring science-based decision-making and promoting the evidence-based implementation of policies at the national and regional levels, it is essential to recognize the importance of precautionary approach, as well, and the ways in which the Stockholm and Rotterdam conventions, in particular, have addressed uncertainty and/or gaps in information.

The BRS conventions have lengthy track records of successful action to manage the threats to human health and the environment posed by some chemicals and wastes. The conventions, and their relevant technical bodies, play crucial roles in the global governance of hazardous substances. All three conventions are science-based, and different types of data and evidence inform the policy goals and decisions taken by Parties to the respective agreements. However, it is important to note that science is not a monolith, and it plays different roles in supporting the implementation of each agreement. As such, these conventions are well positioned to offer lessons that could support considerations of potential design elements of a possible new science-policy interface.

2. WHAT ARE THE EXISTING MECHANISMS FOR SCIENCE-POLICY INTERFACE UNDER THE BRS CONVENTIONS?

The BRS conventions are three of the primary multilateral mechanisms for coordinated global action to address the impacts of chemical pollution on human health and the environment. Each of these legally binding treaties is designed to address a different facet of the production, use and disposal of chemicals of global concern, with the aim of protecting human health and the environment from the impacts of exposure to chemical and waste pollution. Science is a core component of each of these multilateral environmental agreements, informing technical experts', policymakers' and other stakeholders' evaluation of problems, formulation of recommendations and policy responses, and supporting implementation by Parties and other stakeholders at the regional and national levels.

The BRS conventions have been working at the interface of science and policy since their establishment, meeting new challenges and emerging trends in their respective areas of responsibility for management of chemicals and waste. Each of these conventions is structured to ensure that science plays a significant role in policymaking; as such, stakeholders can draw lessons from the successes and challenges Parties, technical experts, and diverse stakeholders have dealt with as they have worked to fulfill the objectives of each of these conventions.

Several mechanisms have been created to facilitate science-based decision-making under the BRS conventions. These mechanisms, many of which are critical elements of the decision-making processes under these conventions, are outlined below.

2.1 THE BASEL CONVENTION ON THE CONTROL OF TRANSBOUNDARY MOVEMENTS OF HAZARDOUS WASTES AND THEIR DISPOSAL

The creation of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal was triggered by discoveries that waste disposal operators were dumping wastes from developed countries in developing countries. Specifically, these operators were circumventing tightening environmental regulations and increasing costs of disposal in developed countries by depositing hazardous wastes in countries with limited environmental regulations and/or enforcement. The dumped hazardous waste released toxic chemicals into the environment, endangering humans and ecosystems. There are several cases of illegal dumping which have caused deaths and serious health consequences for people who are exposed to the waste.

Most hazardous waste is generated in industrialized countries, and the amounts of waste generated each year have increased significantly over time. In a 2018 World Bank study, Kaza et al. find that the pace of waste generation will be double that of population growth by 2050. Disposal of waste is both costly and technically complex, and toxic chemicals are often released into the environment during disposal and recycling of products such as medical equipment, electronics, and other common goods. Electronic waste, for example, often contains lead, chromium, and brominated flame retardants (Selin 2010). Waste is a significant problem for all countries, and strong global governance of the transport and disposal of such wastes is essential to combat dangerous, illegal dumping and transfers of waste from North to South. This "toxic trade" led to the negotiation of the Basel Convention, which was adopted in 1989 and entered into force in 1992. There are currently 189 Parties to this agreement.

The objective of the Basel Convention is to protect human health and the environment from the adverse effects of hazardous waste. It addresses a broad range of wastes defined as hazardous, including industrial, agrochemical, medical and plastic waste, as well as household waste and incinerator ash. To achieve its objective, the Basel Convention aims to:

(a) Reduce the generation and promote environmentally sound management of hazardous wastes in the locations in which they are disposed;

(b) Restrict transboundary movements of hazardous wastes, except where such movements are perceived to be in accordance with: 1) the principles of environmentally sound management and 2) a regulatory system applying to cases where transboundary movements are permissible.

To achieve these objectives, the Basel Convention requires Parties to observe fundamental principles of environmentally sound waste management. It also establishes a mandatory prior informed consent (PIC) procedure, by which exporting Parties must notify prospective importing and transit states and request their permission to transport the wastes through/to their territories. Movement of the wastes may only take place when all States involved in this process have given their written consent. Furthermore, Parties are not permitted to export wastes to countries that are not Party to the Convention, or to allow imports from non-Parties; nor are any Parties allowed to transport hazardous wastes to Antarctica.

Importantly, the Basel Convention declares that Parties consider illegal traffic in hazardous or other wastes to be criminal. It requires Parties to implement and enforce the provisions of the Basel Convention, including by taking measures to prevent and punish conduct that contravenes these provisions. Furthermore, the Basel Convention includes a range of provisions for information exchange between Parties, as well as technical assistance for developing countries.

Since its adoption, the Basel Convention has evolved and expanded, as Parties have sought to strengthen the implementation and rise to new challenges. Key developments include the 2019 entry into force of the Ban Amendment, which prohibits exports of all hazardous wastes covered by the Convention from member states of the European Union, Organization for Economic Cooperation and Development (OECD), and Lichtenstein to all other countries. Also in 2019, at its fourteenth meeting, the Conference of the Parties to the Basel Convention adopted amendments to the Annexes II, VIII and IX with the objective of strengthening control of transboundary movements of plastic waste. Together, these amendments address the scope and types of plastic waste which are presumed to be hazardous and therefore subject to the PIC procedure. These amendments took effect in January 2021.

SCIENCE AND THE BASEL CONVENTION

Science plays a critical role in the ongoing development and implementation of the Basel Convention, particularly with regard to the scope of the agreement, definitions of different kinds of waste, and development of technical guidelines for environmentally sound management of waste. The last point is particularly important - a crucial contribution of the Basel Convention to management of hazardous wastes is the work it undertakes to set these standards. While they are not legally-binding, these guidelines set a baseline that countries can use to ensure their policies meet the threshold required by the Basel Convention. The guidelines are designed to support developing countries, in particular.

The development of the draft technical guidelines falls to the Open-Ended Working Group (OEWG), a key subsidiary body to the Conference of the Parties to the Basel Convention. Unlike the Rotterdam and Stockholm Conventions, the Basel Convention does not have a dedicated science-advisory body; rather the OEWG has a broad mandate to address a range of issues associated with implementation of the convention. Specifically, this body is mandated to:

(a) Assist the COP in developing and continuously reviewing the implementation of the Convention's work plan, operational policies and decisions taken by the COP for implementation of the Convention;

(b) Consider and advise the COP on a range of issues, including those relating to policy, technical, scientific, legal, institutional, administration, finance, budgetary and other aspects of implementation of the Convention. This work includes: 1) identifying specific needs of regions and subregions for training and technology transfer and 2) considering ways and means of ensuring the establishment and functioning of the Basel Convention Regional Centres for training and technology transfer;

(c) Prepare its work plan for consideration by the COP and report to the COP its activities.

The work of the OEWG is supported by experts with relevant technical expertise for a given area of work. In keeping with the interdisciplinary nature of the OEWG's responsibilities, it relies on input from experts with specialist competency that is categorized as either technical or legal. Legal experts contribute to the implementation of the Convention, while the technical experts contribute to development of the evidence-based policies such as the technical guidelines on specific wastes streams or disposal operations.

While the technical guidelines are drafted by experts, they must be discussed and approved by the COP. Existing guidelines address issues including, *inter alia*: waste containing persistent organic pollutants (POPs); e-waste; wastes consisting of, containing or contaminated with mercury or mercury compounds; plastic waste; biomedical and healthcare wastes; recycling/reclamation of metals and metal compounds; and the environmentally sound co-processing of hazardous wastes in cement kilns.

INFORMATION SHARING AND AWARENESS RAISING AT THE LOCAL, NATIONAL AND REGIONAL LEVELS

As noted above, the Basel Convention has established regional or sub-regional centres for training and technology transfer. These Regional and Coordinating Centres for Capacity Building and Technology Transfer are designed to cater to the specific needs of different regions and sub-regions as they deal with the specific circumstances and challenges that shape their work toward minimization and environmentally sound management of hazardous and other wastes. To date, there are fourteen regional centres, all of which operate under the authority of the COP. These centres carry out a range of tailored training and capacity building activities and have been established in either inter-governmental or national institutions with the expertise and capacity to provide technical assistance and capacity building. More information on their activities can be found here: http://www.basel.int/tabid/2334.

2.2 THE ROTTERDAM CONVENTION ON THE PRIOR INFORMED CONSENT (PIC) PROCEDURE FOR CERTAIN HAZARDOUS CHEMICALS AND PESTICIDES IN INTERNATIONAL TRADE

Exponential growth in the production and use of synthetic chemicals since the 1970s has resulted in dramatic increases in trade in both developed and developing countries, but the negative impacts have been particularly acute in countries that lack the capacity to monitor the import and use of hazardous chemicals in their territories. While deployment of pesticides in many developing countries protected millions from vector-borne diseases and boosted agricultural productivity, use of these pesticides was not strictly controlled, endangering the people exposed to inappropriate levels of these substances. In an effort to enhance information exchange and raise awareness of the impacts of these substances, the Rotterdam Convention on the Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals and Pesticides in International Trade was negotiated. The Rotterdam Convention, adopted in 1998, is designed to facilitate information exchange among countries about chemicals that pose risks to human health and/or the environment. The Convention, which is supported by a secretariat hosted jointly by the UN Environment Programme and the FAO, entered into force in 2004 and currently has 165 Parties.

The Rotterdam Convention aims to:

(a) Promote shared responsibility and cooperative efforts among Parties in the international trade of certain hazardous chemical; and

(b) Contribute to the environmentally sound use of those hazardous chemicals, by facilitating information exchange about their characteristics, by providing for a national decision-making process on their import and export, and by disseminating those decisions to Parties to the Convention.

By creating legally binding obligations for the implementation of the Prior Informed Consent (PIC) procedure, this Convention enables importing Parties to refuse shipments containing chemicals listed under the Convention. Countries that are exporting listed substances are required to notify importing countries and obtain explicit permission prior to exporting the hazardous chemicals. In addition to serving as a mechanism for Parties to exchange information about hazardous substances prior to trade in these chemicals, the Rotterdam Convention also includes a mechanism for ensuring that exporting Parties comply with the decisions of importing Parties.

Specifically, the Rotterdam Convention requires Parties that have taken final regulatory action to ban or severely restrict any chemical to notify the Secretariat no later than 90 days after the regulatory action has taken effect. The Convention defines “final regulatory action” as one that does not require subsequent regulatory action, and which either prohibits all uses of the chemical or eliminates virtually all uses of the substance. Importantly, these final regulatory actions must have been taken in order to protect human health and/or the environment. The process for reviewing and listing a substance under the Rotterdam Convention is delineated below, with a more detailed description of the role of science in the work of this Convention.

Furthermore, any Party that is a developing country or country with an economy in transition can propose a severely hazardous pesticide formulation for listing. The Committee screens these proposals against the criteria in Annex IV. As defined in the Convention text, a severely hazardous pesticide formulation is "a chemical formulated for pesticidal use that produces severe health or environmental effects observable within a short period of time after single or multiple exposures, under conditions of use" in its territory (Rotterdam Convention Article 2(d)). In other words, developing countries or countries with economies in transition can submit proposals to list SHPFs in Annex III because they are unsafe in the conditions of use in low- and middle-income countries. These proposals are based on reports of poisoning incidents. This measure is designed to protect agricultural and other workers who may have limited or no access to protective personal equipment, may not have access to labels with proper usage information (e.g., in cases where chemicals are repackaged for informal sale in small quantities), or may be unable to read warning labels.

The PIC procedure applies to chemicals listed in Annex III of the Rotterdam Convention, which includes pesticides, industrial chemicals, and severely hazardous pesticide formulations (SHPFs). Currently, 53 chemicals are listed in Annex III, including 35 pesticides, 16 industrial chemicals, and 1 substance that is categorized as both a pesticide and industrial chemical. I guess you don't want to mention the number chemicals which, on the basis of science, have met the criteria for listing, but have been declined by the COP?

SCIENCE AND THE ROTTERDAM CONVENTION

Like the Basel and Stockholm conventions, the Rotterdam Convention was designed to ensure that its policy decisions are evidence-based. As such, all proposals to list substances under the Convention are first reviewed by the Chemical Review Committee, which serves as a science advisory body that is subsidiary to the COP.

The Chemical Review Committee is tasked with reviewing notifications of final regulatory action against the criteria set out by the Convention in Annex II (for chemicals) and IV (for severely hazardous pesticide formulations (SHPFs) and making recommendations to the COP. As such, this science-advisory body is composed of 31 government-designated experts in chemical management. Experts are nominated by Parties and confirmed by the COP, which considers the need for diversity in gender and geographic representation. Each member serves a term of four years, with no more than two consecutive terms. The rotation of membership is staggered to ensure some continuity within the Committee, with half of the members rotating off the Committee every two years.

The Chemical Review Committee carries out a multi-stage review process to determine whether a notification of final regulatory action to ban or severely restrict a chemical fulfills the requirements of Annex I (information requirements for notifications made pursuant to Article 5) and the criteria set out in Annex II (criteria for listing banned or severely restricted chemicals in Annex III) or whether a proposal to list a severely hazardous pesticide formulation contains the required information and meets the criteria set out in Annex IV (information and criteria for listing severely hazardous pesticide formulations in Annex III). The Committee's decision and rationale for its conclusion as to whether the criteria are fulfilled will be included in the report of the meeting.

Proposals to include chemicals under Annex III are submitted to the CRC for review, and the final decision on whether to list a given chemical in Annex III is taken by the COP. There are two ways to trigger the addition of new chemicals to Annex III. For pesticides and industrial chemicals, all Parties must notify the Secretariat of any regulatory action they have adopted domestically to ban or severely restrict a chemical for environmental or health reasons. When the Secretariat receives two notifications of final regulatory action from two different PIC regions (Africa, Asia, Europe, Latin America and the Caribbean, Near East, North America, and Southwest Pacific) that meet the criteria established in Annex I to the Convention (which describes properties, identification, and uses of the chemical and information on the regulatory action), it forwards the notifications to the CRC. The Committee then screens the notifications according to the criteria contained in Annex II. If the CRC finds the criteria are met, it recommends listing the chemical in Annex III and prepares a decision guidance document (DGD) for consideration by the COP.

While decision-making takes place during the meetings of the Chemical Review Committee, substantial work is carried out intersessionally to prepare documentation for the Committee's consideration. In full, there are seven steps in Chemical Review Committee's process, as the Committee has outlined in a flowchart (see the Handbook of Working Procedures and Policy Guidance for the Chemical Review Committee, available here: http://www.pic.int/tabid/1060).

These steps can be summarized as follows:

(a) The Secretariat forwards verified notifications/proposals to CRC members via email.

(b) Members of the CRC provide comments on the documentation and establish a task group for further work on the notifications/proposals

(c) At the next meeting of the CRC, the task group presents the notification in full for consideration by the Committee.

(d) When the Committee decides a chemical fulfills the relevant requirements of the Convention, it forms a drafting group to prepare an internal proposal for a recommendation.

(e) During the intersessional period, this internal proposal is circulated to CRC members and observers (e.g., Parties, intergovernmental organizations, and representatives of civil society groups and industry) for comments.

(f) The drafting group will incorporate comments from CRC members and take note of comments from observers. It will prepare a draft decision guidance document for consideration at the next meeting of the CRC.

(g) If the draft decision guidance document is adopted by the Committee, the CRC will forward its recommendation and decision guidance document to the COP for consideration at its next meeting.

The decision guidance document defines the chemical that is being listed, setting out information including its hazard classification and possible alternatives. This document is not updated or revised following its adoption and is not intended to be the sole source of information about the chemical. These decision guidance documents are available on the Rotterdam Convention website for stakeholders' reference: http://www.pic.int/tabid/2413.

It is important to note that the COP to the Rotterdam Convention does not always accept the recommendations of the CRC. For example, in five cases the COP has agreed that chemicals recommended for listing fulfill the criteria but has not agreed to subject them to the PIC procedure. These chemicals include the herbicide acetochlor, the pesticide carbosulfan, and chrysotile asbestos and two severely hazardous pesticides formulations: fenthion (ultra-low-volume (ULV) formulations at or above 640 g active ingredient/L) and liquid formulations (emulsifiable concentrate and soluble concentrate) containing paraquat dichloride at or above 276 g/L, corresponding to paraquat ion at or above 200 g/L. In each case, the chemical is widely used and economically valuable to multiple Parties to the Rotterdam Convention. This illustrates the intersection of political/economic concerns with science-based evaluation of risks. While listing a substance in the Rotterdam Convention is designed to facilitate information exchange and does not constitute a ban on production or trade, interviews with some government and private sector stakeholders have reflected concerns that listing a substance under the Rotterdam Convention will dampen demand for the substances or products which contain them.

INFORMATION SHARING AND AWARENESS RAISING ACTIVITIES AT THE LOCAL, NATIONAL AND REGIONAL LEVELS

Several activities are carried out under the auspices of the Rotterdam Convention to enhance implementation, raise awareness, and build capacity for chemicals management where needed.

(a) PIC Circular: The PIC Circular is the key mechanism for sharing information about the notifications. Compiled by the Secretariat and distributed to Parties and stakeholders each June and December, this critical document provides Parties and other stakeholders with up-to-date information about any decisions taken by the COP, including the addition of new chemicals to the Convention; it also provides a comprehensive summary of the status of all proposals and notifications received since 1998.

(b) Capacity-building initiatives and training opportunities: The Rotterdam Convention carries out a wide range of capacity-building activities each year, including webinars, on-site workshops, and – in partnership with external stakeholders from academia, civil society, ministerial departments, and intergovernmental organizations – facilitates country-specific projects designed to enhance sustainability. More information about these projects can be found here: http://www.pic.int/tabid/8593.

These activities are designed to ensure that the stakeholders at different levels are able to access information about the substances listed in the Rotterdam Convention and translate that information into action at the local level, where it will have the most impact on environmental protection and workers' safety.

2.3 THE STOCKHOLM CONVENTION ON PERSISTENT ORGANIC POLLUTANTS

The Stockholm Convention on Persistent Organic Pollutants (POPs), which was adopted in 2001 and entered into force in 2004, aims to protect human health and the environment from the threats posed by this specific category of global pollutants. POPs are carbon-based chemicals that are toxic to humans and wildlife. Because they can be carried long distances on air and water currents, they are found in areas of the world far from the source of their release into the environment. Thus, global cooperation is necessary to understand the impact of POPs and to effectively address this transboundary pollution problem.

To be categorized as a POP, the Stockholm Convention specifies that a chemical must demonstrate the following characteristics:

(a) Persistence: Once released into the environment, the chemical does not degrade for many years (decades or more). In the case of PFAS, a class of substances that is gaining public attention, they are so long-lasting that they are colloquially known as "forever chemicals.")

(b) Bioaccumulation: As a result of their persistence, these chemicals accumulate in the fatty tissues of humans and other living organisms, increasing in concentration as they are passed upward through the food chain. Mammals pass concentrations of POPs in stored in their bodies to their offspring during gestation and through their lipid-rich breastmilk.

(c) Adverse effects: These chemicals are toxic to humans and wildlife and are associated with a range of adverse impacts on the health of living organisms (e.g., endocrine disruption, birth abnormalities, and population decline).

(d) Long-range environmental transport: These chemicals are widely dispersed through the environment via soil, water and air. This is a crucial characteristic that necessitates global cooperation. Some of the highest concentrations of POPs are found in the Arctic Circle, where these substances are neither produced nor used.

The Stockholm Convention is a "living" treaty that was designed to enable Parties to add newly identified POPs over time. Since the Convention entered into force in 2004, Parties have added 18 POPs to the original 12 listed in the Annexes of the Convention. This flexibility enables the Convention to respond to new information and evolving scientific research into the growing number of synthetic chemicals that are produced and used around the world.

The Annexes themselves give Parties some flexibility in determining which control measures are appropriate for a given substance. This flexibility is an important feature of the Stockholm Convention, as it acknowledges the complexity of taking global action on substances that – while hazardous – may also be of vital social or economic importance, and for which substitutes may not yet be accessible or affordable (e.g., dichloro-diphenyl-trichloroethane, commonly known as DDT, which continues to be the single most effective, affordable and accessible means of malarial vector control).

The Annexes of the Stockholm Convention include the following:

(a) Annex A - Elimination: Production and use of the intentionally produced POPs listed in this Annex are prohibited, although Parties may request specific, time-limited exemptions for continued production and. When all exemptions have expired or been withdrawn, no new requests for exemptions may be made. Currently, Annex A contains 26 substances.

(b) Annex B – Restriction: Annex B was designed to restrict, rather than wholly eliminate, those chemicals which have been identified as POPs but, as noted above, are needed for critical uses such as disease vector control (in the case of DDT). This Annex allows for the registration of acceptable purposes for production and use of the listed POPs and enables Parties to request registration of specific exemptions for production and use. Substances listed in this Annex are heavily restricted, but the availability of acceptable purposes is not time limited. This Annex contains only two substances: DDT and the industrial chemical perfluorooctane sulfonic acid (PFOS), which is currently registered only for use in insect baits with sulfluramid (CAS No. 4151-50-2) as an active ingredient for control of leaf-cutting ants from *Atta* spp. and *Acromyrmex* spp. for agricultural use only.

(c) Annex C – Unintentional Production: This Annex contains those substances which are created unintentionally, usually as a by-product of another process (e.g., incineration of waste, specific

chemical production processes that unintentionally produce POPs, textile and leather dyeing and finishing, etc.).

Parties may decide to list a POP in Annex A, B, and/or C, depending on whether the substance is intentionally and/or unintentionally produced and – perhaps more significantly – the implications of eliminating a chemical. While Annex B is rarely used, particularly in comparison with Annex A, the need to continue using POPs in these rare cases demonstrates that policy decisions must sometimes reconcile competing, crucial needs. In the case of DDT, the science was clear; DDT is a persistent organic pollutant that is likely to have significant adverse effects on human health and the environment. However, Parties agreed that its use as a critical tool in the fight against malaria, an acute problem that disproportionately affects countries in Sub-Saharan Africa, is essential until such time as other effective, affordable and accessible solutions are identified. While DDT was one of the 12 original POPs to be listed in the Convention, the need for its continued production and use for malaria control remains, while noting that its global use has continued to decline. In the latest *World Malaria Report*, the WHO reported there were 241 million cases of malaria in 2020, an increase from 227 million the previous year.

SCIENCE AND THE STOCKHOLM CONVENTION

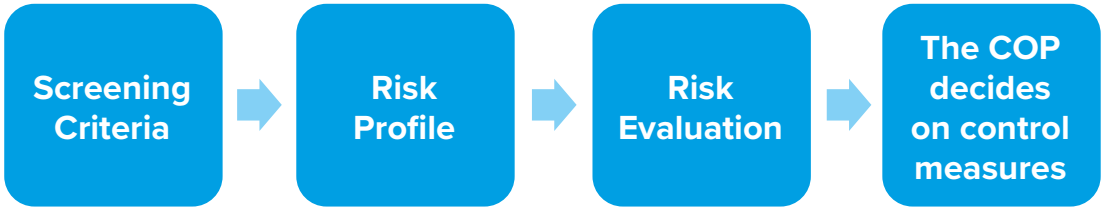
The Stockholm Convention is designed to foreground science in its decision-making process. Chemicals nominated for listing are subjected to extensive scientific review before Parties take policy-focused decisions. This evidence-based process ensures that work carried out under the auspices of the Stockholm Convention is transparent, robust, and data-driven, which in turn ensures that its actions are both effective and credible.

At the heart of the Stockholm Convention's work to control POPs pollution is the Persistent Organic Pollutants Review Committee (POPRC), a subsidiary body composed of 31 technical experts from around the world. The experts who comprise the committee are government-designated experts in chemical assessment or management. They are drawn from the five regions of the UN, ensuring global representation, and taking into account the need for diversity of gender and areas of expertise (common disciplinary backgrounds of POPRC members include toxicology, chemistry, biology, and environmental science, among other relevant fields).

The POPRC undertakes a three-stage process to review and prepare technical information for consideration by the Parties to the Stockholm Convention. If, at each stage, the POPRC decides the requirements of the relevant Annex are fulfilled, the Committee will advance the substance to the next stage of review. If it decides that a substance does not meet the criteria, the substance will be set aside, either permanently or until new data suggests the substance merits further consideration.

The POPRC's review process is outlined below. Typically, each stage of review takes place over the course of one year, with the Committee reaching a conclusion on each step at one of its annual meetings.

Overview of the POPRC review process



Any Party to the Stockholm Convention may propose a chemical for listing in Annex A (Elimination), B (Restriction), and/or C (Unintentional Production) of the Stockholm Convention. Upon receipt of a nomination, the Convention Secretariat will verify that the proposal to list a given chemical contains all of the information set out in Annex D (Information Requirements and Screening Criteria) and forward the proposal to the POPRC for its consideration.

During this first stage of its review, the POPRC evaluates the proposal to determine whether there is evidence that the nominated substance meets the screening criteria, which include persistence, bioaccumulation, potential for long-range environmental transport, and adverse effects on human health and the environment or toxicity or ecotoxicity data that indicate the potential for damage to human health and the environment.

If the POPRC determines that the screening criteria are fulfilled, the Committee will draft a risk profile (Annex E) for consideration at its next meeting. This work, much of which is carried out intersessionally by a working group in which both POPRC members and observers may participate, involves a more stringent review of the properties of a given substance. Specifically, during this stage of review the POPRC must evaluate whether the chemical is likely, as a result of long-range environmental transport, to lead to significant adverse human health and/or environmental effects, such that global action is warranted. The risk profile will include information about the sources of the chemical (e.g., production data, ways in which the substance is used, and sources from which they are released), a hazard assessment for the endpoint(s) of concern (including toxicological interactions involving multiple chemicals), environmental fate (data and information on the physical properties of a chemical, its persistence, and how these are linked to its environmental transport), monitoring data, information about exposure due to long-range environmental transport, national and international risk evaluations, assessments, or profiles, and the status of the chemical under international conventions.

If the Committee decides, based on the information contained in the risk profile, that global action on the substance is warranted, it proceeds to the third and final stage of its review process: preparation of a risk management evaluation (Annex F). This evaluation provides information to Parties about possible control measures for the substance, including management and elimination. Crucially, to support decision-making by the COP, this document also provides extensive information about the potential socio-economic implications of possible control measures.

Following the adoption of the risk management evaluation, the POPRC forwards this document and its recommendation for listing to the COP for consideration by the Parties. Drawing on this information, the COP is responsible for deciding whether to list the chemical in the Annexes to the Convention, and if so, which control measures (Elimination, Restriction, and/or controls related to Unintentional Production) are appropriate. In addition to the POPRC's scientific assessment of risks and potential impacts of a given substance on human health and the environment, the COP will also discuss the socio-economic implications of listing the substance. In this way, the Stockholm Convention separates scientific assessment from discussion of policy implications of listing.

The POPRC's successes in supporting rigorous, science-based decision-making under the Stockholm Convention are due in part to the design of the committee, with geographically and disciplinarily diverse representation of technical expertise. Another crucial factor has been the consistent and active participation of observers from civil society, industry, and academia. Stakeholders with specialist knowledge of the chemicals under review have played an important part in the POPRC's work, both during meetings and intersessionally, by sharing knowledge as producers, users, or members of groups or communities directly affected by POPs pollution. Since its first meeting in 2005, the POPRC has consistently worked to ensure the active engagement of these stakeholders, drawing on, for example, their knowledge of the ways in which chemicals are used in the field, the specific routes by which people can be exposed to a given substance, and whether proposed control measures will be practical and effective. The involvement and input of observers have continuously strengthened the recommendations produced by the POPRC, not least by providing valuable context for the data that is evaluated by the committee.

LEVERAGING FORMAL GLOBAL NETWORKS TO SUPPORT IMPLEMENTATION

In addition to the science advisory body that serves as a backbone to the work of the Stockholm Convention, Parties have created dedicated mechanisms intended to facilitate awareness raising and science-based action on key issues under its remit. For example, the COP has created two groups to tackle the ongoing challenge of DDT: an Expert Group, which is responsible for assessing the global production and use of DDT and its alternatives and examining Parties' work to reduce the use of DDT for disease vector control, as well as the Global Alliance for Alternatives to DDT, which promotes science-based action to identify and deploy cost-effective alternatives to malaria. The Alliance is focused on outreach to and engagement with a broad range of stakeholders, with key goals that include improving coordination among different initiatives to develop and deploy alternatives to DDT and creating momentum to address related challenges. It seeks to enhance information-sharing among stakeholders, raise public awareness of these issues, and spur new action to address this enduring and critical issue.

Similarly, in 2009 the COP established the PCB Elimination Network (PEN) to promote environmentally sound management of PCBs, in accordance with the Basel Convention technical guidelines, with the aim of achieving the phase-out goals of the Stockholm Convention. PEN aims to raise awareness and facilitate information exchange on environmentally sound management of PCBs. The PEN also plays an important role in enhancing science-based action, producing videos, webinars, and fact sheets intended for use by

a wide variety of stakeholders. PEN is a multistakeholder network, with members including Parties to the Stockholm Convention, intergovernmental organizations, non-governmental organizations, experts from academia and other sectors, and business/industry in areas that are relevant to PCBs.

Both the Global Alliance for Alternatives to DDT and PEN demonstrate the ways in which global agreements can mobilize action, disseminate knowledge, raise awareness of issues on a local as well as global scale, and engage a broad range of stakeholders to address environmental challenges. These groups also provide a multidirectional mechanism for communication among stakeholders, creating opportunities for those people who use the relevant chemicals – or are otherwise directly impacted by their use – to communicate their experiences and needs to the Conventions that are creating policy responses.

INFORMATION SHARING AND AWARENESS RAISING ACTIVITIES AT THE LOCAL, NATIONAL AND REGIONAL LEVELS

Like the Basel Convention, the Stockholm Convention has established a network of regional and sub-regional centres to support developing countries and countries with economies in transition in their work to implement their obligations under the Convention. The Stockholm Convention currently has 16 centres in countries around the world. These centres operate under the authority of the Conference of the Parties and have been established in institutions that possessed the appropriate expertise and capacity to provide technical assistance and capacity-building to eligible countries.

The BRS Secretariat also facilitates a wide range of capacity-building activities to support implementation of the Stockholm Convention. These activities include webinars, hosted by experts, providing information about topics such as new POPs listed under the Stockholm Convention, new guidance on POPs management, and briefings ahead of meetings of the Conference of the Parties and the POPRC. These interactive webinars are open to the public and targeted to a range of time zones. For people who are unable to participate in real time, recordings can be downloaded from the Stockholm Convention website. These webinars are intended to ensure that all stakeholders are able to fully participate in the work of the Convention, whether through meetings or in their daily work related to POPs pollution.

2.4 OPPORTUNITY FOR COLLABORATION

The need for deliberate, careful, and constructive cooperation among different entities working within the realm of global chemicals governance is clear. Complex issues related to management of chemicals and wastes require the input of a diverse group of stakeholders, including experts from different disciplines/areas of responsibility, stakeholders with different interests in the production, use and disposal of chemicals, and people at different scales of governance. Credible, robust policies emerge from transparent policymaking processes, are evidence-based, and are multifaceted to address different aspects of these complicated issues. To this end, the BRS conventions have established formal procedures to facilitate collaborative work, as noted above, with joint and back-to-back meetings of their conferences of the Parties. The science-advisory bodies to the Stockholm and Rotterdam Conventions also typically hold back-to-back meetings, with significant overlap in participation by experts from governments, civil society, and business/industry associations.

There are strong institutional and policy linkages among the BRS conventions, which are tackling different aspects of many of the same issues. For example, chemicals that are under review or are listed in the Annexes to the Stockholm Convention are frequently on the agenda of the Rotterdam Convention, as well, as Parties take final regulatory action to ban or restrict their use. Several of the issues that are currently being addressed under these conventions relate to work being done outside of the BRS conventions. For example, in an example of close ties to the Minamata Convention, the Basel Convention has adopted technical guidelines on the environmentally sound management of wastes consisting of, containing or contaminated with mercury or mercury compounds.

Furthermore, both the Basel Convention and Stockholm Convention are currently tackling different aspects of the growing challenges posed by plastics pollution. As noted above, amendments to the Basel Convention entered into force in January 2021 that aimed to enhance control of the transboundary movements and environmentally sound management of plastic wastes. The POPs Review Committee to the Stockholm Convention is currently considering the ways in which plastics wastes that contain POPs may contribute to the global spread of this category of chemicals.

There are several opportunities to create synergies between these mechanisms and a strengthened science-policy interface for wider management of chemicals and waste, including on issues that are adjacent to but not specifically within the mandates of the BRS conventions.

CLIMATE CHANGE AND CHEMICAL POLLUTION

Several studies have pointed to potential links between climate change and POPs pollution, an issue which was first considered by the POPRC in 2011. Since then, scientists have expressed growing concern about the potential links between warming temperatures in the Arctic and the release of accumulated POPs from permafrost (AMAP 2020). For example, the work of the Arctic Monitoring and Assessment Programme focuses on both POPs currently listed under the Stockholm Convention and Chemicals of Emerging Arctic Concern (CEAC), a category which includes several substances with POPs characteristics, many of which may come under consideration by the POPRC in the future.

The Stockholm Convention is well positioned to continue work on this issue, drawing on the technical expertise of individual POPRC members and the Committee's prior examination of this emerging challenge (more information about work carried out on this issue under the auspices of the Stockholm Convention is available here: http://chm.pops.int/tabid/2741).

CHEMICAL POLLUTION AND BIODIVERSITY LOSS

The links between chemical pollution and biodiversity loss are well understood (see, for example, Cristiano et al. 2021; Sánchez-Bayo and Wyckhuys 2019; and Bernhardt et al. 2017). Recognition of the severe impacts of many chemical pollutants on wildlife and ecosystems served as drivers for the establishment of the Basel, Rotterdam and Stockholm Conventions, and inform the science-based evaluations of chemicals under the Stockholm and Rotterdam Conventions. As such, the expert bodies of each of these conventions are well positioned to make significant contributions to enhanced work on these issues.

3. STRENGTHENING THE SCIENCE-POLICY INTERFACE AT THE INTERNATIONAL LEVEL FOR SOUND MANAGEMENT OF CHEMICALS AND WASTE

3.1 A POSSIBLE NEW INTERFACE BETWEEN SCIENCE AND POLICY

Preliminary discussions on the need for a science and policy panel on chemicals and wastes have emphasized the value of a body that is unrestricted by an issue-specific mandate and can therefore offer an overarching perspective on issues related to chemical pollution, as well as robust support and options for solutions to existing institutions to develop specific instruments or policies within the global chemicals' regime.

According to the recent Assessment of Options for a Science-Policy Interface, prepared by UNEP in 2020, an effective science-policy interface for the area of chemicals and waste would:

(a) Engage in horizon scanning: This systematic process focuses on "the early detection of weak signals as indicators of potential change" (National Academies of Sciences, 2020). The SPI would be able to detect early signals of emerging trends, patterns or disruptions related to production, use, disposal and impacts of chemicals and waste.

(b) Identify emerging issues of concern: An effective SPI should be able to draw on early warning signals, proactively interpreting their implications and kickstarting action to address new challenges. This work will require close and early collaboration with existing governance bodies.

(c) Monitor trends: The SPI should have the capacity to monitor and document developing trends in chemical pollution, making links (where appropriate) to other environmental issues, both within the chemicals' regime and in other areas of environmental governance.

(d) Identify, assess and communicate about the environmental and human health issues associated with [exposure to] chemicals and waste. The capacity to communicate effectively with stakeholders at different scales (global, regional, national and local) and from different constituencies will be essential to the effectiveness of the SPI. It will be critical to establish formal and accessible lines of communications to key partners, including the science advisory bodies of the BRS and other conventions.

(e) Evaluate and refine response options: A key expected benefit of a new science-policy interface would arise from its work to fill gaps in current governance arrangements. As such, the body will need to be able to identify and promote appropriate practices, policies, technologies, etc. that can be deployed to prevent pollution and mitigate its impact. This work should be closely aligned with the policies being produced by the global chemicals conventions and other bodies that are currently responsible for significant aspects of global chemical management.

(f) Stimulate new policy approaches: Another key potential benefit of a new science-policy interface would be its capacity to spur the negotiation and enactment of new policy approaches. As production and use of synthetic chemicals has grown over time, so has recognition of new challenges (e.g., establishing regulatory mechanisms that can keep pace with developments in chemical technologies). This body should be able to produce new, research-based solutions to emerging and time-sensitive challenges related to chemical pollution.

While the scope and substance of a mandate for a new science-policy interface will be determined and refined over the course of formal negotiations to establish such a body, the preliminary discussions and decision taken by UNEA-5 give a sense of potential objectives. Together, these elements suggest that a new science-policy interface would be charged with taking early action to identify potential challenges related to chemicals and waste, gather information about these challenges, interpret and frame the issues for policymaking, and convey this information to the wider chemicals and waste sector.

Furthermore, the UNEA resolution indicates that a new science-policy interface should take the form of an independent intergovernmental panel that would provide policy relevant, but not policy prescriptive, advice to support international agencies and instruments, countries, and the private sector. As discussions of this proposal move forward, it will be critical to consider where this panel will sit within the global chemicals' regime, and how it will relate to other bodies. It will be important to avoid overlap with the science-advisory and decision-making mechanisms that are already established. The discussion may focus on how such a panel could work with these mechanisms to streamline its own work, ensuring that its resources and capacity are deployed in the most meaningful, impactful ways possible.

These relationships should be formalized and clearly delineated. In order to maximize the effectiveness of such a panel, as well as the efficiency of resources needed to support is operation, it will be critical to ensure that it is filling gaps in the current structure of global chemicals governance, without overlapping with or duplicating the work that is being carried out by existing bodies. Such considerations will require careful thought and planning in the earliest stages of designing this body.

Relatedly, it will be essential to consider at the design phase the ways in which this body will communicate about its work to other mechanisms for chemicals governance. This is a practical issue, of course, but also one that will shape the relationship between this body and other mechanisms. These arrangements will play an important role in determining the potential impact of the panel's work, both laterally – within the regime of chemicals and waste governance – and vertically, as it seeks to disseminate its findings to the stakeholders who are in a position to take action.

The POPRC, CRC and Basel OEWG are all subsidiary bodies with clearly defined mandates, and a history of successful, science-based decision-making. One way in which these bodies differ from a standalone body such as the proposed science-policy panel is "the responsiveness that is built into an institution that not only reports to the Conference of the Parties but also receives its mandate from Parties" (Kohler 2020, p. 12). These Committees are composed of experts with deep knowledge, are designed to allow invited experts and observers to participate in their work, and can respond quickly to specific, highly technical questions.

3.2 IMPORTANT ELEMENTS IN STRENGTHENING THE SCIENCE-POLICY INTERFACE FOR SOUND MANAGEMENT OF CHEMICALS AND WASTE

Drawing on the years of experience of the Basel, Rotterdam and Stockholm Conventions in building consensus-based policies to address chemical and waste pollution, it is possible to identify several lessons that could be considered in strengthening the science-policy interface for chemicals, waste and pollution.

USING SCIENTIFIC INFORMATION IN DECISION-MAKING

Science should be a core element of policymaking on technically complex issues that pose risks to human health and the environment. A science-policy panel could be charged with gathering and evaluating scientific data (including both quantitative and qualitative data from across the natural and social sciences), communicating its relevance for policymakers, and gathering information on social and economic considerations. This process is not always straightforward: for example, the timelines for research may exceed the time available for policy action; stakeholders (including experts) may interpret data in different ways; and policymakers may have different priorities for action or use of resources. Science does not always provide a clear path to action, and economic, political, and social considerations may play an important role in discussions of potential policy responses.

As recognized in UNEA resolution 5/8, the features of the panel would need to ensure that its work is accessible, transparent, and open; and encourage broad participation in its work, ensuring there are formal mechanisms in place to give voice to those stakeholders from around the world and who together represent a breadth of experience and expertise. This includes ensuring gender diversity and global representation, as is standard in the chemicals and wastes conventions, but could also entail to deliberately and continuously seek to reach people with limited resources or experience of working within the UN system. It would need to provide mechanisms for the full and meaningful participation from non-state actors from academia, the private sector, and civil society, including communities that are disproportionately affected by pollution.

MEMBERSHIP

The size and composition of a science-policy panel will be critical factors for consideration in the design of the panel. If this panel sits alongside existing mechanisms for scientific evaluation and policymaking in the chemicals and waste regime, it will be crucial to ensure that there are formal lines of communication between the panel and other bodies working in this area. This could be achieved through mechanisms such as memoranda of understanding, which could enable the COPs to the BRS (and other) conventions to request advice or share information about areas of concern or interest. These communications could inform the assessments undertaken by the science-policy panel. Additionally, representatives of specific conventions could potentially participate in working groups tasked with investigating particular issue areas.

A second, related question is the nature of experts' participation. Will they serve as independent experts? Will they represent particular organizations or governments? Should there be a mix of ways for people to participate? While independence is often prized in science-advisory bodies, it will be essential to ensure that experts are truly speaking on their own behalf and do not feel constrained or responsible to countries or other organizations with which they are affiliated. Robust conflict-of-interest procedures could help mitigate such risks, but other steps may be valuable in ensuring that participants' interests and affiliations are clearly stated.

Finally, it will be important to consider not just experts' associations, but their disciplinary backgrounds. While many science advisory bodies prioritize somewhat narrowly defined expertise in a relevant field of the natural sciences, preliminary discussions indicated interest in including experts from social sciences and the humanities alongside experts in chemical and waste management. It will be important to define the contributions these experts can make and ensure that the mandate for the science-policy interface makes use of their expertise. Within the social sciences, for example, the field of discard studies is flourishing, with growing interest from academics with backgrounds in geography, political science, sociology, and anthropology, among other fields. The insights that could be provided by these experts could inform the way that science is understood and deployed in the process of policymaking. Similarly, social scientists can provide critical insights into the ways in which the design of social structures – including regulatory systems, processes, and policies – can be strengthened to achieve their intended outcomes.

REPRESENTATION

Years of work with science-advisory bodies has demonstrated that the process of reaching evidence-based conclusions is substantially strengthened by input from individuals with different areas of expertise, experiences, and positions within the constellation of stakeholders who are affected by a given problem. This would include the expertise of academic researchers, chemicals managers, producers of substances (i.e., business/industry), those who use the substances, and those who are affected by the pollution. Each of these categories will almost certainly include a diverse group of stakeholders, often from different areas of the world and with different interests and perspectives that can help policymakers better understand different facets of a problem. For example, a business that uses a chemical in production of an article can provide critical information about potential substitutes, potential changes in demand for goods, production processes, etc. An agricultural worker can provide essential information about the actual conditions in which a pesticide is used. A stakeholder from a community affected by chemical and waste pollution can provide insights into the health and environmental impacts and the viability of proposed responses. This practical knowledge can inform discussions of control measures, ensuring that such measures will be more likely to achieve their intended outcomes.

Formalizing opportunities for such engagement in a science-policy interface appears to be a key design element. This could include recognition and formal affirmation of the value of different types of knowledge or "ways of knowing," including traditional knowledge (e.g., local observations, oral histories, etc.). Such efforts will help ensure that the mechanism achieves the goals of inclusivity that have been cited in preliminary discussions. It will also be helpful to formalize – perhaps through rules related to membership, participation of observers, invitations to experts, etc. – these avenues to participation, with the aim of giving stakeholders who want to be involved in discussions the means to do so.

TRANSPARENCY

There are several ways to enhance the transparency of work being carried out within the UN system, including the highly technical discussions that will likely be a feature of a new science-policy interface. Several measures are standard in the operation of multilateral environmental agreements, including giving observers access to meetings, posting meeting documents on a publicly accessible website, hosting webinars to brief stakeholders on outcomes (or to help prepare them for participation in a meeting), and provision of simultaneous interpretation in the six UN languages (Kohler 2020).

NETWORKS AND PARTNERSHIPS

As noted above in the summary of the Stockholm Convention's establishment of the PCB Elimination Network and the DDT Alliance, partnerships can be valuable tools for creating pathways to communication about a given issue. In the context of a science-policy panel, such partnerships could aim to create new or strengthen existing linkages within the chemicals regime, both vertically and horizontally. They could be used to ensure that bodies and individuals with relevant expertise are fully engaged with the work of the panel and can both feed into the work and represent the panel externally.

These partnerships could be designed to strengthen ties between the chemicals regime and other sectors of environmental governance, including – but not limited to – climate and biodiversity. They would also establish clear connections to intergovernmental agencies and organizations, as well as their subsidiary bodies. They could also be used to facilitate engagement with different groups of stakeholders at the local, national and regional levels, not only reaching people who are likely to be interested in chemicals governance, but also reaching those who are concerned about biodiversity or climate change. By highlighting the links among issues, such networks could achieve greater impact in their outreach efforts, raise awareness of the importance of chemical and waste pollution, and potentially strengthen the base of support for action on these critical issues.

To be effective, it will be important to establish formal channels of communication by which participants can share information, policy ideas, research, and early warnings about signals and trends in their respective areas.

PROCEDURES FOR DEALING WITH SCIENTIFIC UNCERTAINTY

Uncertainty is a key challenge in science-based policymaking, often creating a barrier to action on time-sensitive issues. For example, stakeholders with economic interests in continued production or use of a chemical may call for additional research to meet a very high threshold for evidence, thus delaying action that would protect human health and the environment – a situation that social scientists refer to as the strategic and deliberate "manufacture of doubt" (Richter et al. 2020). This is particularly likely to be an issue for a science-advisory panel if the panel is mandated to identify early signals of potential problems, trends in chemical and waste pollution, etc. What will the threshold for evidence be for the kind of work this panel would undertake? At what point will the science-policy body decide it has enough information to be able to provide interpretations of problems – much less recommendations for policy responses – to other bodies? Will the panel take decisions by consensus, or will voting be allowed in some (or all) circumstances?

While uncertainty can be exploited by stakeholders with political or economic interests in delaying or preventing action on a given issue, it can also be a point of contention among researchers and other experts who have different levels of tolerance for uncertainty. Scientific research often lags behind policy needs. It will be essential to consider how the interface will deal with this as it prepares its outputs. Even if the panel is providing policy-relevant, but not policy-prescriptive, recommendations, it will need to have clear procedures to guide it through situations of significant uncertainty. This design element will be critical to ensuring that the panel is agile, responsive, and can provide holistic insights to potential or actual challenges. This ability to provide early warnings would be a key area for the panel to add significant value to the chemicals and waste regime.

PROPRIETARY KNOWLEDGE

In addition, this panel would be in a position to make a critical contribution to the global governance of chemical pollution by addressing the critical and ever-growing challenges of proprietary knowledge about the composition of synthetic chemicals. This issue is one of the most significant obstacles to effective management of the risks posed by production, use and disposal of hazardous substances. Regulatory systems that do not require manufacturers to share details about chemical formulations because it is considered to be "confidential business information" create significant obstacles to management of chemical pollution both globally and nationally (Richter 2020, Geiser 2015). As noted above in the discussion of scientific uncertainty, absence of data can be used strategically to slow review processes and defend inaction. This is a complex challenge with ties to national regulatory requirements; as such, resolving it will require extensive research, diplomacy, and work with existing multilateral environmental agreements to identify needs, goals and routes to agreement.

4. STRENGTHENING SCIENCE-BASED DECISION MAKING AT THE NATIONAL LEVEL FOR SOUND MANAGEMENT OF CHEMICALS AND WASTE

An effective science-policy interface should support science-based decision-making not only in the context of global cooperation, but also at the national level. Effectively addressing the sound management of chemicals and waste will require systematic engagement with the policymakers who are responsible for designing and implementing policies, procedures, and other actions to tackle these multifaceted problems. Such an interface should also facilitate the active participation of key stakeholders from the private sector and civil society, as many of these actors will have either experience with the impacts or responsibility for the production and/or use of hazardous substances. National-level strengthening of the interface between science and policy will contribute to efforts to ensure that the science-policy panel is undertaking relevant and valuable assessments, providing policy relevant advice, and effectively disseminating the results of its work to audiences that can respond take meaningful action across a range of sectors.

While effective national engagement is critical across all contexts, it is particularly important for governments and stakeholders in developing countries. Poor and marginalized communities, and particularly those in developing countries, are disproportionately affected by pollution related to chemicals and waste (UNEP 2021; Landrigan et al. 2018). Increased levels of exposure to pollution and its negative effects on human health and the environment are linked to a broad range of systemic and structural challenges, including but not limited to: gaps in technological infrastructure; lack of capacity to enforce robust regulatory regimes; lack of access to personal protective equipment or training; socioeconomic factors such as informal economic trade in hazardous substances (e.g., repackaged/unlabeled pesticides); inadequate storage/disposal facilities; and externally-imposed problems such as the illegal transport and dumping of hazardous wastes.

Strengthening the science-policy interface at the national level can have several key benefits, both nationally and globally. First, by engaging key stakeholders on the national and sub-national levels, an SPI can support the dissemination of relevant scientific data, including policy-relevant, usable information that can be applied to specific national and sub-national circumstances. Disseminating the outputs of an SPI can be challenging when capacity is limited, and many developing countries have only one or two experts who are responsible for a portfolio of multilateral environmental issues. Structured mechanisms for communication between a global SPI and national/sub-national stakeholders can significantly increase the impact of the work done at the global level by reaching more stakeholders, raising public awareness of relevant issues, facilitating access to information and other resources available at the global level, and creating space for dialogue and information exchange (both vertically and horizontally).

It is important to note that broader participation does not automatically yield better results in a science-policy dialogue, in any context. Factors such as imbalances in power among stakeholders can negatively affect the quality of such dialogue, particularly if scientific literacy is limited or the information is not considered to be credible or relevant by participants (Ramirez and Belcher 2019). One way of countering these challenges is to concentrate on strengthening the legitimacy of the work done by the SPI by, for example, building trust among participants, facilitating ready access to usable information gathered or produced by the SPI, and ensuring that processes by which the panel's work is carried out are transparent and open. Such measures can ensure that the work of the SPI is accessible, relevant and useful for stakeholders working in a wide range of roles and sectors. Furthermore, workshops and other mechanisms that bring stakeholders together can build relationships and networks, enhancing lateral flows of information and ideas.

Communication between participants at the global and national level should be bi-directional; in addition to the 'top-down' communications via assessments and other outputs from global collaborations, stakeholders working at the national and local levels should be able to feed into the work of the SPP through their governments and/or direct participation in the work of the panel and its subsidiary groups. Workshops

and other participatory opportunities for people who are not serving in a formal capacity can facilitate information and idea exchange, strengthening work across scales. Such forums for communication and knowledge-sharing will enhance the access of on-the-ground stakeholders to critical scientific data. Ensuring mechanisms for collaboration and formal records of communications will also enable them to deepen the panel's shared understanding of what is required for sound management of chemicals and waste in specific circumstances.

Stakeholders can bring nuance and depth to discussions by providing information about local contexts, including the social, economic and political factors that will affect the success of different strategies. This information will strengthen analyses of the causes of problems and the range of viable policy responses, which may vary in effectiveness according to context. They can also challenge dominant understandings of issues and the causal relationships that inform policy responses. For example, these communication channels could facilitate exchange of critical information about the conditions of use, demand for chemicals or products containing hazardous substances, labor markets, and other critical factors that vary across national and local contexts. Thoughtful consideration of how to facilitate this input will be an essential part of incorporating research from the natural and social sciences from underrepresented areas of the world, traditional knowledge, and other 'ways of knowing' into the work of a new science-policy panel.

Strong science-policy interfaces can raise awareness of critical issues and possible policy responses, build networks among stakeholders, and facilitate cooperation and information exchange among key actors at working across sectors and scales. Wang et al. (2019) also find that, among other benefits, science-policy interfaces can build confidence in science-based action and foster commitment to action. All of these benefits apply to both developed and developing country contexts. Attention to the barriers to access and full participation that are common across developing countries will be a critical part of establishing a strong and effective science-policy panel.

WORK UNDER THE BRS CONVENTIONS AT THE NATIONAL LEVEL

Work to strengthen science-based decision-making and implementation under the BRS Conventions has been underway for a number of years, most notably through the joint "science to action" initiative launched by the three COPs in 2015. In this set of decisions (BC-12/22, RC-7/12, SC-7/30), the COPs:

(a) Recognized the importance of the science-policy interface to the effectiveness of the conventions;

(a) Stressed the need for scientific underpinning for decision-making and policymaking related to the sound management of hazardous chemicals and waste at the national and regional levels; and

(b) Recognized the need for greater access to scientific understanding in developing countries to enhance informed decision-making on the implementation of the conventions.

This initiative, informally known as the road map from science to action, has been updated in subsequent years to take note of progress achieved and to establish new milestones. In 2017, the COPs took note of the revised draft road map and emphasized that processes are in place to ensure science-based work and decision-making under the Conventions. Parties also emphasized the importance of, and the need to enhance, the interaction between scientists, policymakers and other actors in the policy process, in order to promote the exchange, development and joint construction of knowledge, with the aim of achieving more informed decision-making for achieving the objectives of the conventions.

At their 2019 meetings, the BRS COPs took note of the draft road map for further engaging Parties and other stakeholders in an informed dialogue for enhanced science-based action in the implementation of the conventions prepared by the Secretariat (BC-14/INF-40; RC-9/INF-35; SC-9/INF-44). In their decisions BC-14/25, RC-9/13, SC-9/23, the BRS COPs invited Parties and observers to submit to the Secretariat information on action being undertaken to promote the implementation of the road map. It also requested the Secretariat, subject to the availability of resources, to undertake capacity building and training activities to support Parties in taking science-based action in the implementation of the BRS conventions.

In January 2020, the BRS Secretariat hosted the first of what is expected to be a series of sub-regional workshops to enhance science-policy-industry interaction and to support Parties in science-based decision-making for the implementation of the conventions. The workshop was attended by 33 participants from English-speaking countries of the African region, including Ethiopia, The Gambia, Ghana, Kenya, Lesotho, Malawi, Nigeria, Rwanda, South Africa, Uganda, Tanzania and Zimbabwe. Other participants including representatives of the BRS Secretariat, the Basel Convention Coordinating Centre for the African Region in Nigeria, UNDP, and UNIDO. The three-day workshop aimed to improve the effectiveness of the BRS conventions by:

(a) Increasing the understanding of participants of the importance of accessibility and availability of scientific and technical information relevant to the Conventions; and

(b) Increasing national capacity to review and assess scientific and technical information for decision-making and implementation.

Participants listened to presentations and worked collaboratively in break-out sessions to share experiences and practices on issues such as the benefits of and opportunities for science-policy-industry interactions; improving availability of and access to scientific and technical information of relevance to the BRS Conventions; strengthening national capacities to use the scientific and technical information for implementation of the BRS Conventions; and support for science-based decision-making for implementation of the Conventions.

At the end of the workshop, participants identified key conclusions and recommendations specific to support capacity building and improved access to scientific data. For example, participants concluded that:

(a) Scientific data related to the national and local environments are not available in Africa for most needs that may be required for implementation of the Conventions;

(b) The limited data that is available is often not credible, well-formatted, or complete, which seriously limits its usability;

(c) Capacity to generate scientific data in most African countries is "grossly limited due to poor and inadequate research facilities";

(d) Some important data required for implementation are not available even on the BRS platforms;

(e) Access to data at the international level is often hampered by lack of awareness of its existence, as well as inadequate or expensive infrastructure for access;

(f) Lack of political can hamper policies even when institutional capacities and frameworks for using data exist.

(g) They further recommended that, *inter alia*:

(h) Capacity for institutional data generation and management should be strengthened at the national level including through provision of adequate facilities to universities and research institutions;

(i) Enabling environments should be created for publication of research results;

(j) Scientific information should be mainstreamed in policymaking, with the establishment of steering committees and other institutions to ensure the use of scientific information in decision-making;

(k) Industry should be incentivized to invest in scientific research;

(l) Methods of communicating scientific information to policymakers should be improved through training activities.

The full list of conclusions and recommendations is available here: http://www.brsmeas.org/Implementation/TechnicalAssistance/Workshops/WorkshopLagos,NigeriaJan2020/tabid/8290/language/en-US/Default.aspx

Together, these conclusions and recommendations illustrate common challenges faced by developing countries in fully engaging with and utilizing information and resources provided at the global level. They reinforce the conclusions of the studies cited above, particularly with regard to the practical challenges of access to data and need for capacity-building for research and analysis. Further workshops will yield additional insights that can inform the design of a new science-policy panel.

REFERENCES

AMAP, 2021. *POPs and Chemicals of Emerging Arctic Concern: Influence of Climate Change*. Summary for Policy-makers. Arctic Monitoring and Assessment Programme (AMAP), Tromsø, Norway. https://www.amap.no/documents/doc/pops-and-chemicals-of-emerging-arctic-concern-influence-of-climate-change.-summary-for-policy-makers/3511

Bernhardt, Emily S., Emma J. Rosi, and Mark O. Gessner. 2017. "Synthetic chemicals as agents of global change" in *Frontiers in Ecology and Environment*, Vol. 15, Issue 2, March 2017, pp. 84-90. https://doi.org/10.1002/fee.1450\

Cristiano, Walter, Cristina Giacoma, Mario Carere, and Luara Mancini. 2021. "Chemical pollution as a driver of biodiversity loss and potential deterioration of ecosystem services in Eastern Africa: A critical review" in *South African Journal of Science*, Vol. 117, No. 9-10. http://dx.doi.org/10.17159/sajs.2021/9541

Damba, F.U., Mtshali, N.G. & Chimbari, M.J. 2021. Barriers and facilitators of translating health research findings into policy in sub-Saharan Africa: A Scoping Review. *Humanities and Social Science Communications,* Vol. 9, Issue 65. https://doi.org/10.1057/s41599-022-01070-2

Downie, David Leonard and Terry Fenge, Eds. 2003. *Northern Lights Against POPs: Combatting Toxic Threats in the Arctic.* McGill-Queen's University Press, Montreal & Kingston.

Geiser, Ken. 2015. *Chemicals without Harm: Policies for a Sustainable World.* The MIT Press, Cambridge, Massachusetts.

Hiroyuki Kano, Takehiko I. Hayashi. 2021. "A framework for implementing evidence in policymaking: Perspectives and phases of evidence evaluation in the science-policy interaction" in *Environmental Science & Policy*, Vol. 116. https://doi.org/10.1016/j.envsci.2020.09.001

Kaza, Silpa, Lisa C. Yao, Perinaz Bhada-Tate, and Frank Van Woerden. 2018. What a Waste 2.0 : A Global Snapshot of Solid Waste Management to 2050. Urban Development;. Washington, DC: World Bank. https://openknowledge.worldbank.org/handle/10986/30317

Keller, Ann Campbell. 2009. *Science in Environmental Policy: The Politics of Objective Advice*. The MIT Press, Cambridge, Massachusetts.

Kohler, Pia M. 2020. *Science Advice and Global Environmental Governance: Expert Institutions and the Implementation of International Environmental Treaties.* Anthem Press, London.

Landrigan, Philip J., Richard Fuller, Howard Hu, Jack Caravanos, Maureen L. Cropper, David Hanrahan, Karti Sandilya, Thomas C. Chiles, Pushpam Kumar, and William A. Suk. 2018. "Pollution and Global Health – An Agenda for Prevetnion" in *Environmental Health Perspectives*, Vol. 126, No. 8. https://ehp.niehs.nih.gov/doi/full/10.1289/EHP3141

Naidu, Ravi, Bhabanada Biswas, Ian R. Willett, Julian Cribb, Brajesh Kumar Singh, C. Paul Nathanail, Frederic Coulon, Kirk T. Semple, Kevin C. Jones, Adam Barclay, and Robert John Aitken. 2021. "Chemical pollution: A growing peril and catastrophic risk to humanity" in *Environment International*, Vol. 156. https://doi.org/10.1016/j.envint.2021.106616

National Academies of Sciences, Engineering, and Medicine; Division on Engineering and Physical Sciences; Health and Medicine Division; Policy and Global Affairs; Division on Earth and Life Studies; Forum on Cyber Resilience; Board on Health Sciences Policy; Board on Science, Technology, and Economic Policy; Board on Agriculture and Natural Resources; Board on Life Sciences; Committee on Safeguarding the Bioeconomy: Finding Strategies for Understanding, Evaluating, and Protecting the Bioeconomy While Sustaining Innovation and Growth. Safeguarding the Bioeconomy. Washington (DC): National Academies Press (US); 2020 Jan 14. 6, Horizon Scanning and Foresight Methods. https://www.ncbi.nlm.nih.gov/books/NBK556423/

Ogunseitan, Oladele A. 2013. “The Basel Convention and e-waste: translation of scientific uncertainty to protective policy” in *The Lancet: Global Health*. Vol. 1, Issue 6. https://doi.org/10.1016/S2214-109X(13)70110-4

Ramirez, Luisa F. and Brian M. Belcher. “Stakeholder perceptions of scientific knowledge in policy processes: A Peruvian case-study of forestry policy development” in *Science and Public Policy*, Vol. 46, Issue 4. https://doi.org/10.1093/scipol/scz003

Richter, Lauren, Alissa Cordner, and Phil Brown. 2020. “Producing Ignorance through Regulatory Structure: The Case of Per- and Polyfluoroalky Substances (PFAS)” in *Sociological Perspectives*, Vol. 64, No. 4, pp. 631-656. https://doi.org/10.1177/0731121420964827

Sanchez-Bayo, Francisco, and Kris A.G. Wyckhuys. 2019. “Worldwide decline of the entomofauna: A review of its drivers” in *Biological Conservation*, Vol. 232, pp. 8-27. https://doi.org/10.1016/j.biocon.2019.01.020

Selin, Henrik. 2010. *Global Governance of Hazardous Chemicals: Challenges of Multilevel Management.* The MIT Press, Cambridge, Massachusetts.

United Nations Assembly of the United Nations Environment Programme. “Resolution 4/8: Sound management of chemicals and waste.” Adopted by UNEA on 28 March 2019. https://wedocs.unep.org/bitstream/handle/20.500.11822/28518/English.pdf?sequence=3&isAllowed=y

UNEP. 2021. “Neglected: Environmental Justice Impacts of Marine Litter and Plastic Pollution.” Nairobi. https://news.un.org/en/story/2021/03/1088712

Wang, Zhanyun, Glen W. Walker, Derek C. G. Miller, and Kakuko Nagatani-Yoshia. 2020. “Toward a Global Understanding of Chemical Pollution: A First Comprehensive Analysis of National and Regional Chemical Inventories” in *Environmental Science and Technology*, Vol. 54. https://pubs.acs.org/doi/10.1021/acs.est.9b06379?ref=pdf

World Health Organization. *World Malaria Report 2021*. https://www.who.int/teams/global-malaria-programme/reports/world-malaria-report-2021

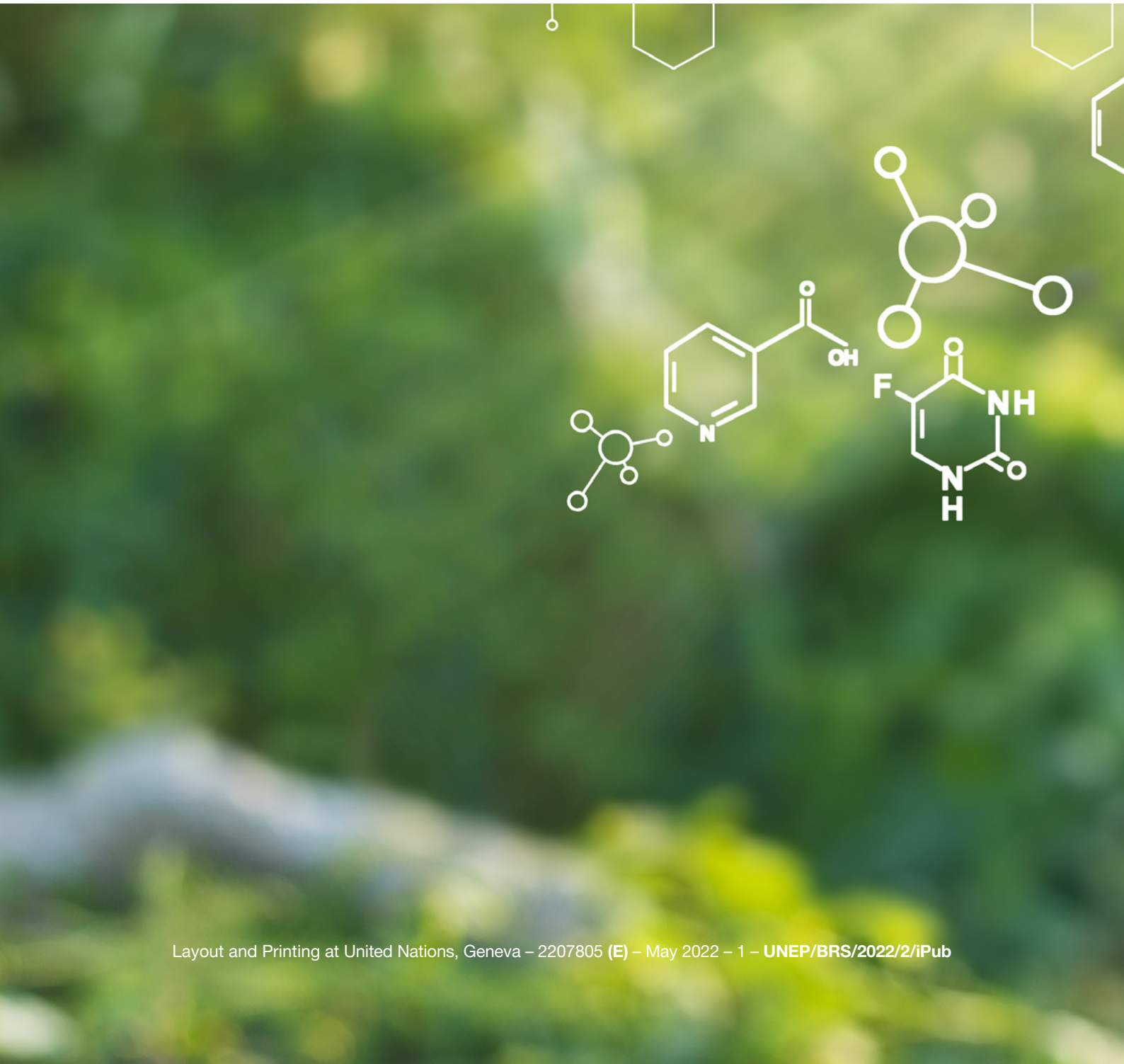
Stockholm Convention DDT expert group report, 18 December 2020, UNEP/POPS/COP.10/INF/9, at: http://chm.pops.int/TheConvention/ConferenceoftheParties/Meetings/COP10/tabid/8397/Default.aspx

www.brsmeas.org

Secretariat of the Basel, Rotterdam and Stockholm Conventions
Email: brs@brsmeas.org

Office address
United Nations Environment Programme (UNEP)
International Environment House 1
Chemin des Anémones 11-13
CH-1219 Châtelaine GE
Switzerland

Postal address
Palais des Nations
Avenue de la Paix 8-14
CH-1211 Genève 10
Switzerland



Layout and Printing at United Nations, Geneva – 2207805 **(E)** – May 2022 – 1 – **UNEP/BRS/2022/2/iPub**